

No. 670,074.

Patented Mar. 19, 1901.

G. P. HEILMAN.

SYSTEM OF SEWER VENTILATION AND DISINFECTION.

(Application filed Apr. 11, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

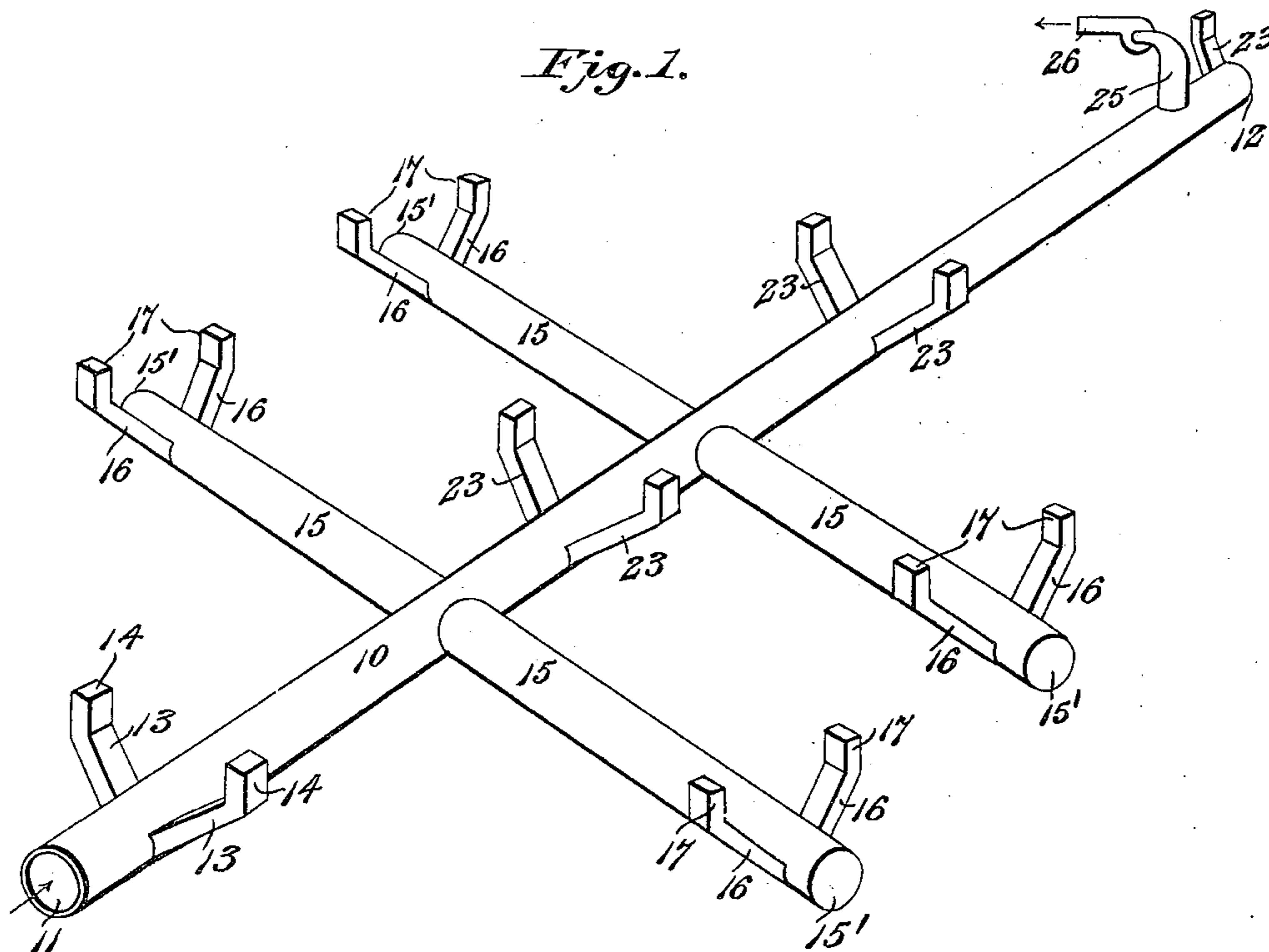
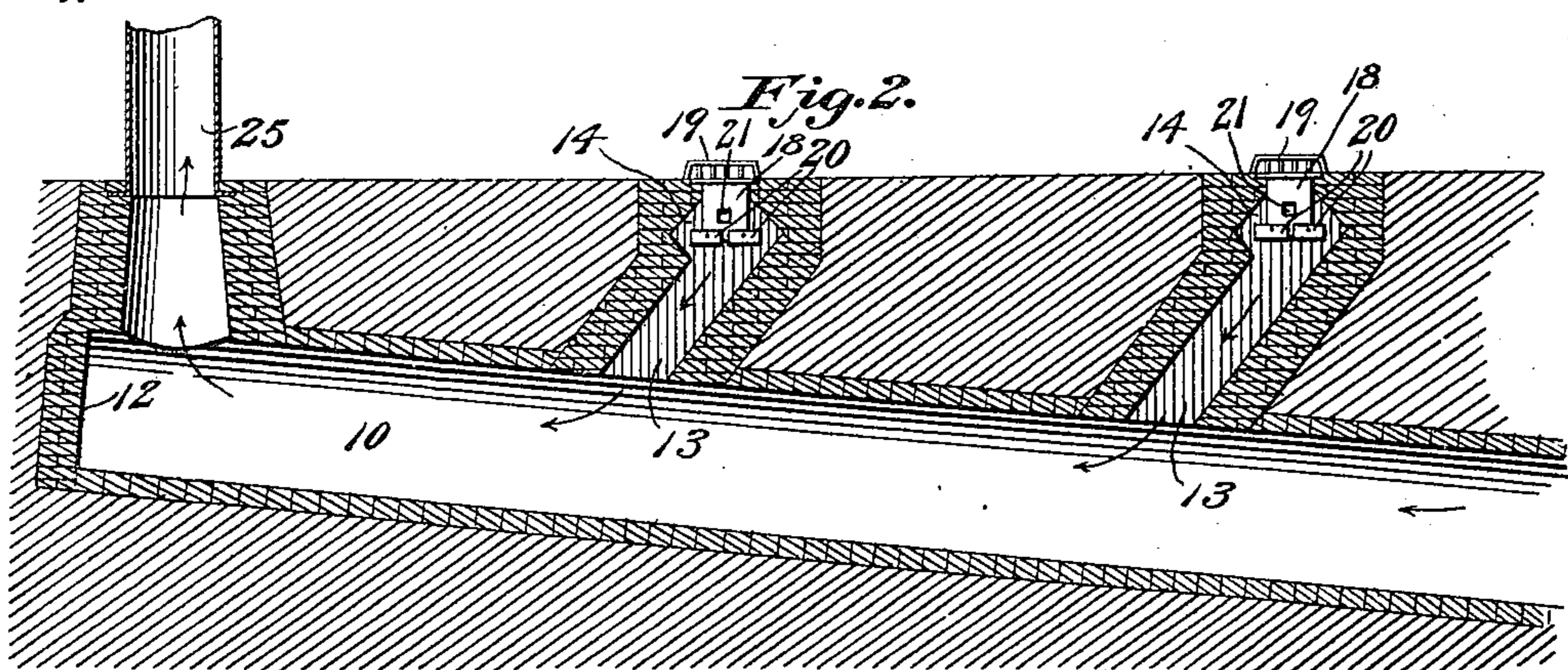


Fig. 2.



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Fig. 3.

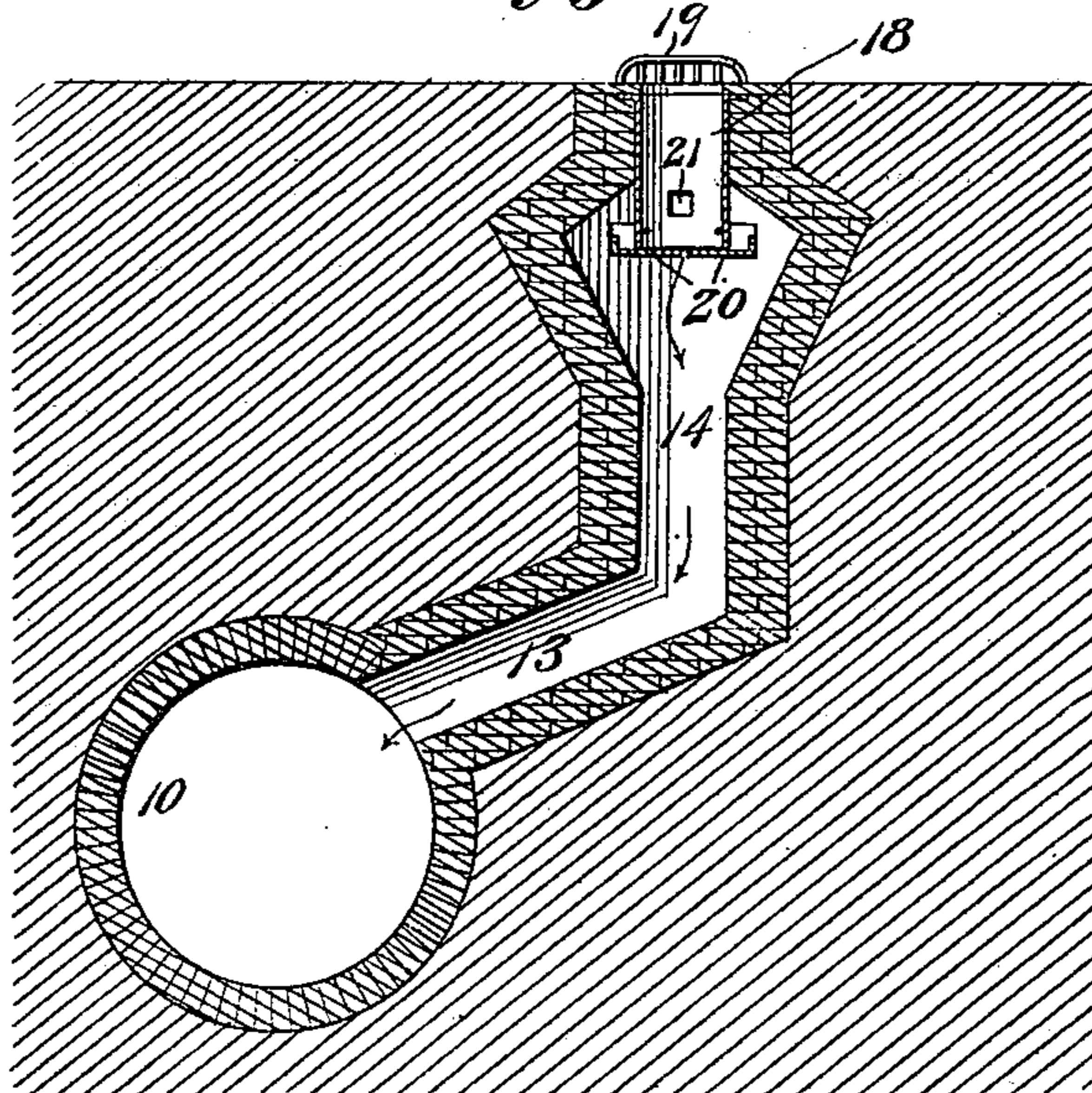


Fig. 4.

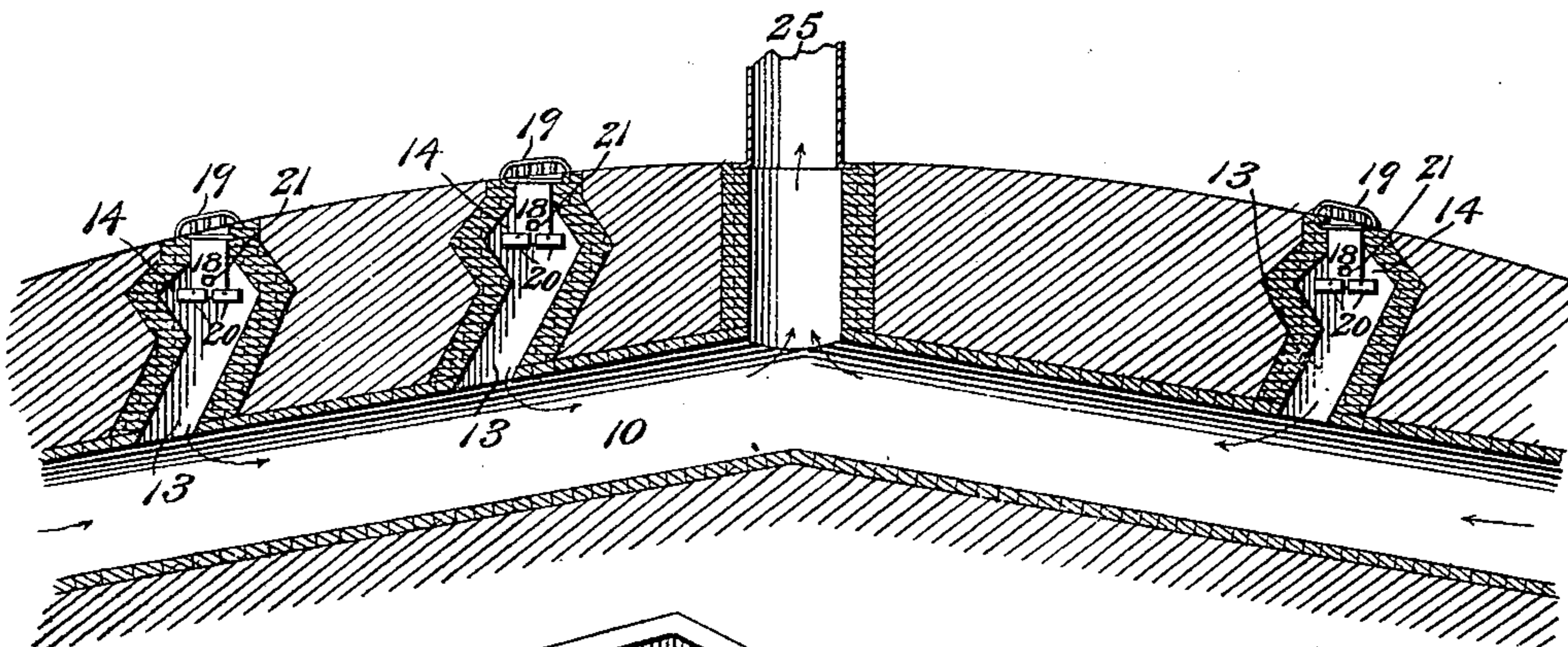
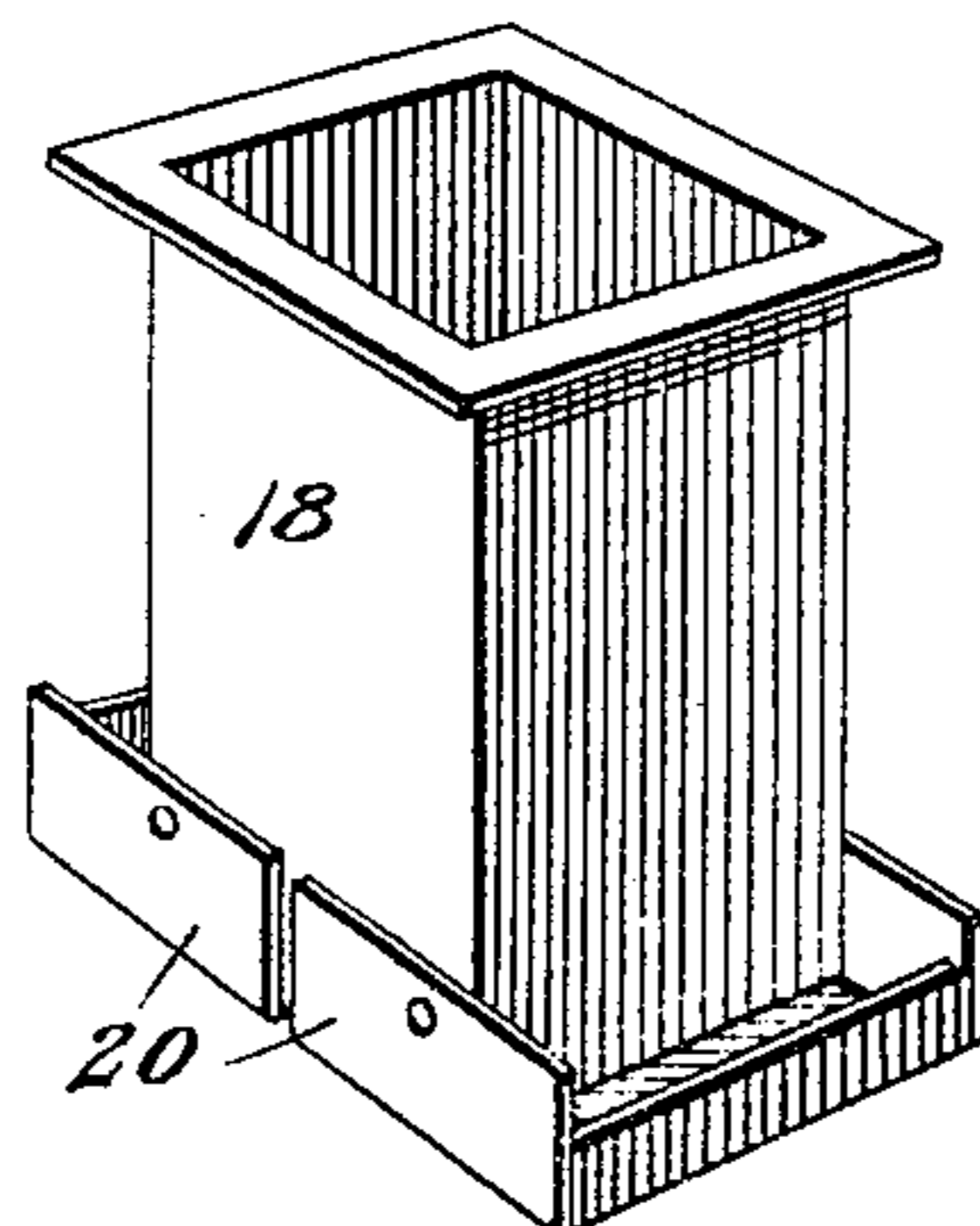


Fig. 5.



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Fig. 6.

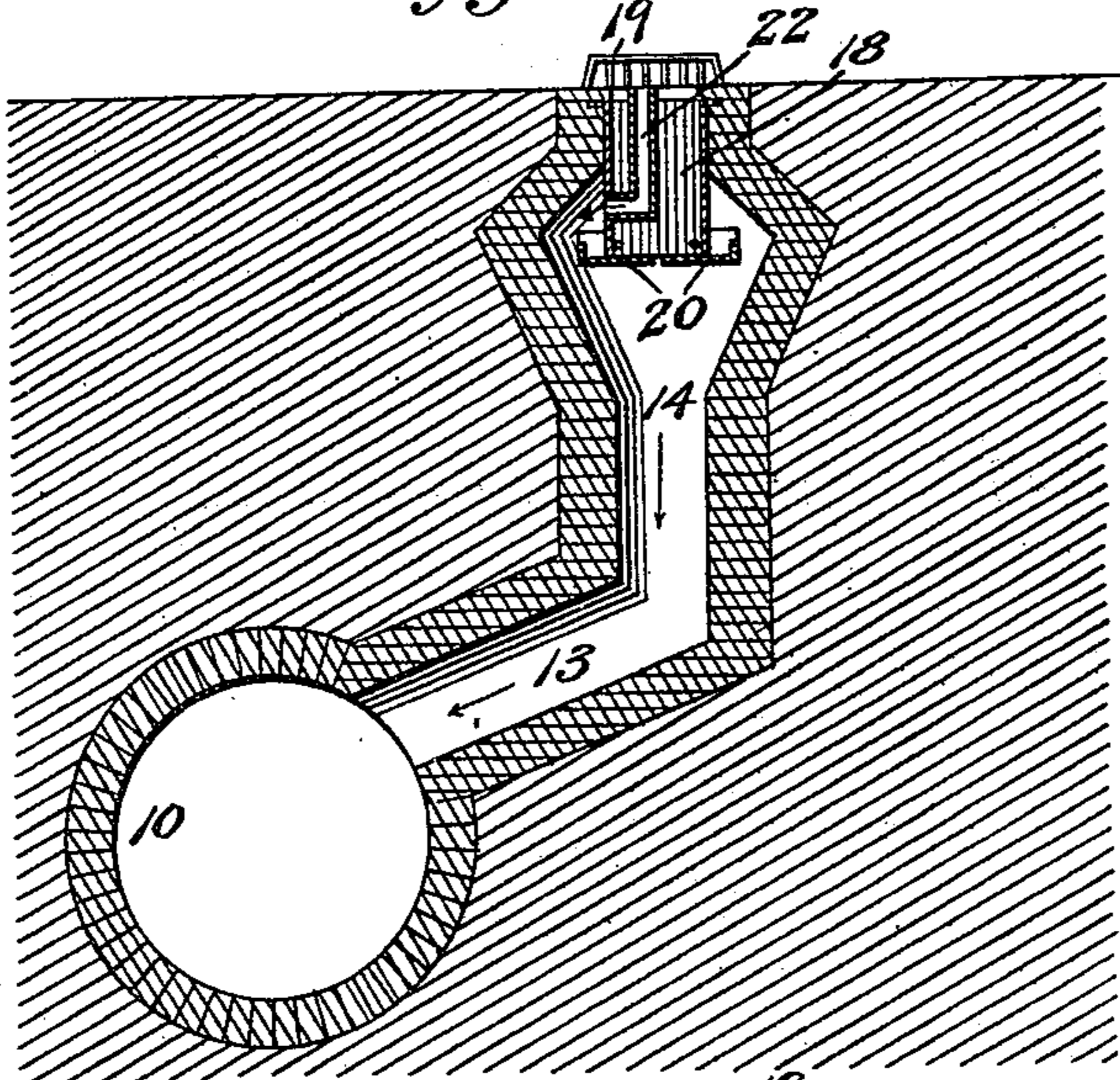


Fig. 7.

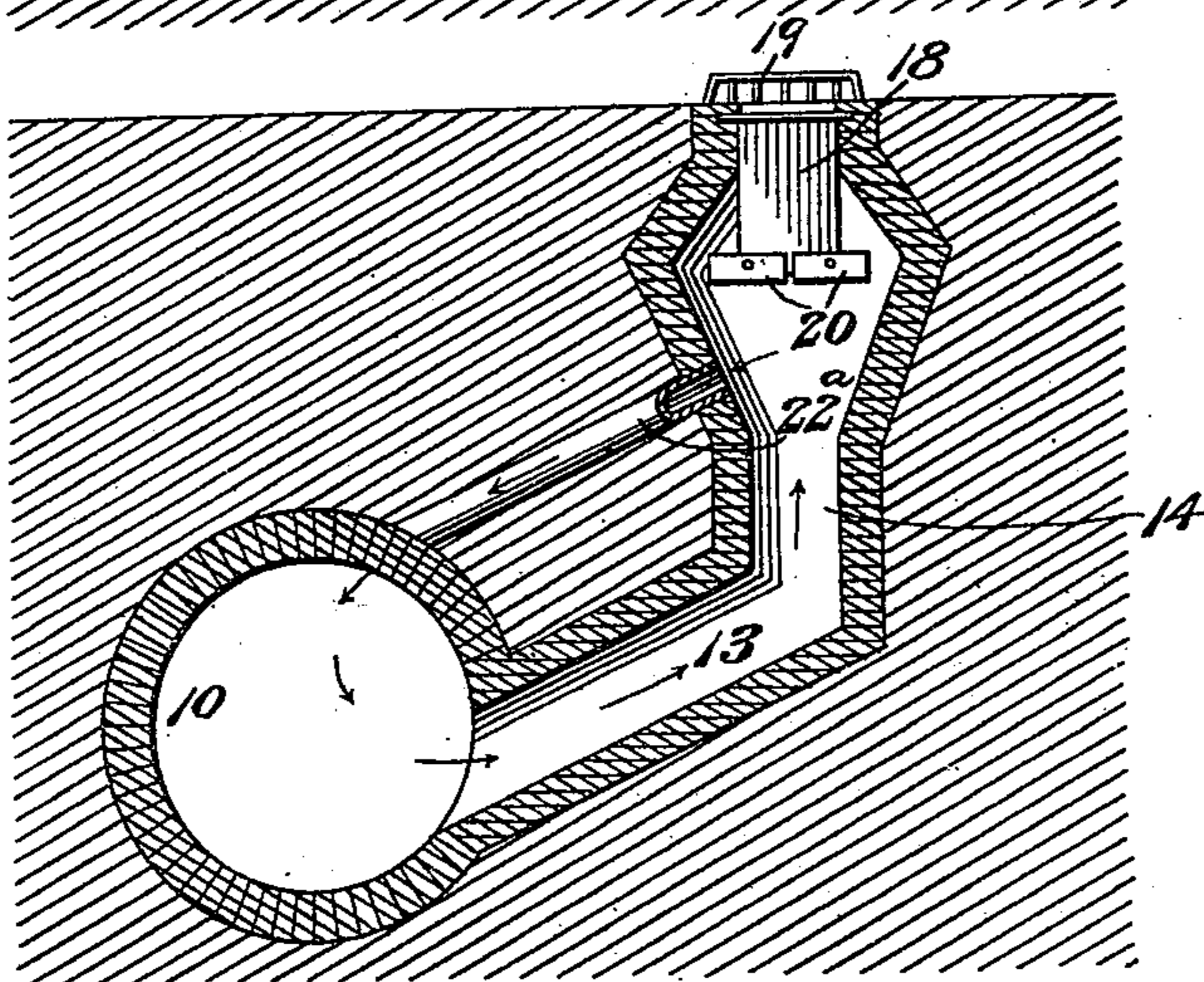
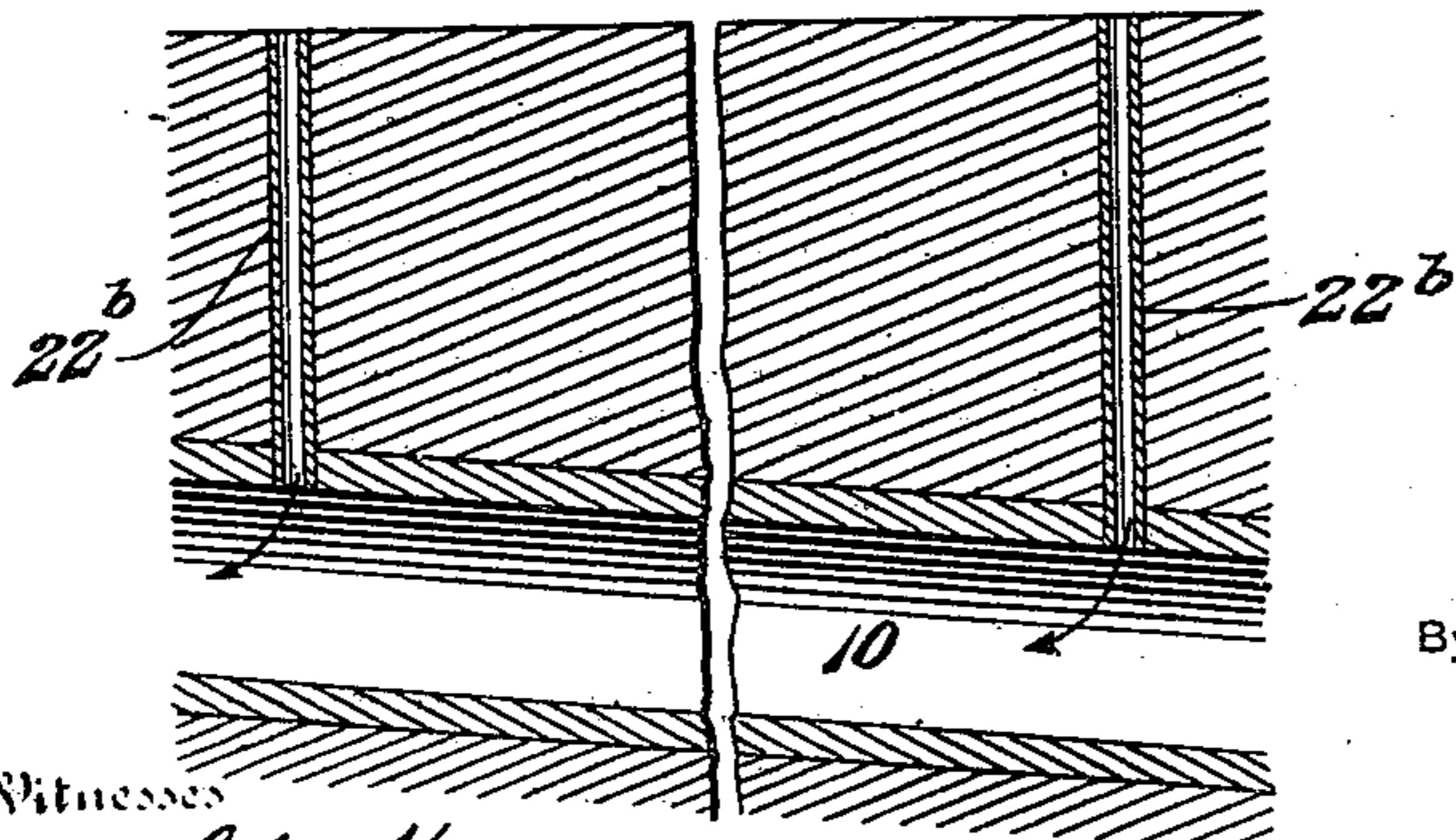


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE PHILIP HEILMAN, OF EVANSVILLE, INDIANA.

SYSTEM OF SEWER VENTILATION AND DISINFECTION.

SPECIFICATION forming part of Letters Patent No. 670,074, dated March 19, 1901.

Application filed April 11, 1900. Serial No. 12,472. (No model.)

To all whom it may concern:

Be it known that I, GEORGE PHILIP HEILMAN, a citizen of the United States, residing at Evansville, in the county of Vanderburg and State of Indiana, have invented a new and useful System of Sewer Ventilation and Disinfection, of which the following is a specification.

This invention relates to a system of sewer ventilation by which I secure the elimination of noxious and injurious gases arising from the sewage matter in the course of disposing thereof, as well as the destruction of disease-spreading insects, such as mosquitos, which swarm in unhealthful places.

A further purpose of the invention is to aerate or ventilate each surface inlet to the sewer system by securing the constant circulation of a modicum of air from the street-surface toward the main sewer, thereby preventing the accumulation of sewer-gases in or at the surface inlet and obviating the passage of such gases into the atmosphere of the street or dwelling.

A further purpose is to disinfect the sewer and each of the branches and street-inlets thereto, thus contributing to the maintenance of a sanitary condition of the sewer.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty and the construction and arrangement of parts comprising the improved system will be defined by the claims.

In the drawings, Figure 1 is a diagrammatic view of a sewer system contemplated by the present invention. Fig. 2 is a longitudinal sectional view through a sewer system, illustrating a series of street-inlets and their conduits in communication with the main sewer. Fig. 3 is a transverse section in a plane at right angles to that of Fig. 2. Fig. 4 is a sectional elevation of another type of sewer system adapted to a ridge or hill of ground. Fig. 5 is a detail enlarged view of an automatic trap for the street-inlet. Fig. 6 is a sectional view showing a modified construction in which the fresh-air inlet for the modicum of air is in the form of a ventilating-tube extending upward through the trap and communicating directly with the inlet-conduit. Fig. 7 is a sectional view showing a

modified arrangement for ventilating the inlet-conduits by means of a draft or suction maintained throughout the main sewer. Fig. 8 is a modification showing a short section of the sewer in which a modicum of air may be admitted through the medium of ventilating-tubes extending therefrom to the surface of the ground.

The same numerals of reference are used to indicate like and corresponding parts in each of the figures of the drawings.

The main sewer 10 of my improved system may be of any usual construction known to the art, preferably circular in cross-section. One end of this main sewer has an open mouth 11, adapted to discharge the sewer's contents into a stream, basin, or other place of deposit; but the other extremity of this main sewer has a closed or "dead" end 12.

A series of inlet-conduits 13 communicate with the main sewer at a number of points intermediate its length, each inlet-conduit terminating in a street-inlet 14, situated at the surface of the ground or pavement. The surface inlets of the series of inlet-conduits must necessarily be provided with means for normally maintaining the liquid-inlets closed, and to secure this result the surface inlets of the several inlet-conduits are preferably provided with automatic traps. These traps may be of any suitable construction capable of accomplishing the desired result, but for illustrative purposes are of the character illustrated in Fig. 5 of the drawings, and which traps will be hereinafter more fully described in connection with the other parts entering into the construction of the sewer system.

The sewer system contemplates in addition to the main sewer 10 the employment of a series of laterals 15, any suitable number of which may be adopted. Each lateral has an outer closed or dead end 15', while the other end of the lateral is in direct communication with the main sewer 10. With each lateral communicates one or more street-inlet conduits 16, each having a street-inlet 17 which is similar to the inlets 14 of the inlet-conduits 13. The surface inlet to each inlet-conduit may be set flush with the surface of the street or open into the same through the curb in a manner that will be understood by those skilled in the art. Within the surface

inlet to each inlet-conduit I employ an automatic trap, which consists of a suitable casing 18, that is covered at its top by a grating 19 and is normally closed by one or more valves 20. I do not desire to confine myself to the special construction of valves forming a part of the automatic trap, although in Fig. 5 of the drawings I have illustrated one type of trap which is especially adapted to my improved system. In the construction shown the casing 18 of the trap has its upper end closed by a grating 19, while a pair of the valves or gates 20 are hinged or pivoted to the lower portion of the trap, said gates or valves being overbalanced for the purpose of having the same normally closed. The gates or valves serve in a large measure to check the outflow of noxious gases from the sewer through the surface inlet and thence into the atmosphere of the street; but these valves will open automatically on the inflow of the surface-drainage water, which is thus free to pass the trap and flow through the inlet-conduit and thence either through the lateral 15 into the main sewer 10 or directly from the inlet-conduit into the sewer-main, as will be understood.

The casing 18 of the trap is arranged within the inlet-conduit or the surface inlet in such a way as to provide an intermediate air-space between the trap-casing and the conduit. One of the important features of the invention consists in the provision of a fresh-air inlet from the street-surface through the trap for the purpose of admitting a modicum of air into the inlet-conduit above the valve or gate of the trap, such supply of fresh air being drawn through the trap and the inlet-conduit into the main sewer by suction. This is an important part of the system, because the admission of the fresh air obviates the accumulation of sewer-gases under the trap, and the circulation of air from the trap toward the main sewer carries off the noxious gases which have a tendency to accumulate in the trap, the inlet-conduit, and the lateral from the main sewer.

In one embodiment of the fresh-air inlet for securing the result noted there is provided an inlet port or ports 21 in the side or sides of the trap-casing 18, preferably at a point above the valve or valves thereof, said port or ports 21 communicating directly with the inlet-conduit through the aforesaid intermediate air-space between the trap-casing and the conduit.

Another modification of the fresh-air inlet is shown in Fig. 6 of the drawings and involves the employment of an air-supply tube 22, which extends from the inlet-conduit up to the street-surface. This air-supply tube 22 may be arranged inside of the trap-casing and joined to one side thereof, so as to open directly into the conduit and not into the trap, or may be arranged in any other approved way so as to provide a direct ventilating-passage from the street into the inlet-

conduit; but in either arrangement of the said tube 22 the result is necessarily the same, and to secure the effective use of the tube 22 the exposed end thereof is preferably exposed above the street-surface in a suitable way to maintain such end in an open position at all times, while the same is so arranged as to prevent obstruction by foreign matter.

In the embodiments of the fresh-air inlet already described provision is made for admitting a modicum of air into the inlet-conduit through the intermediate air-space between the exterior of the trap-casing and the conduit; but in some uses of the invention it may be found desirable to ventilate the inlet-conduit by means of a draft or suction maintained through the main sewer itself. Such a modification of the invention is illustrated in Fig. 7 of the drawings and consists in employing the ventilating tube or pipe 22^a, which connects the main sewer 10 with the inlet-conduit at a point below the automatic trap therein. In this arrangement of parts the draft through the main sewer will draw a modicum of air out of the inlet-conduit below the trapped surface inlet and will create an air-current flowing through the inlet-conduit upward from the sewer and out therefrom through the ventilation-tube toward the draft appliance, as indicated by arrows in Fig. 7 of the drawings.

In a simplified form of the invention where no inlet-conduits are interspersed throughout the length of the sewer the latter may be supplied with a modicum of air at suitable points through the medium of ventilating pipes or tubes 22^b, extending directly from the main sewer up to and through the surface. This arrangement is shown in Fig. 8 of the drawings and is applicable for the ventilation of long private sewers having no inlet-conduits at different points, such sewers being utilized in disposing of waste from isolated public institutions—as, for instance, asylums, hospitals, and the like—which discharge their sewage into creeks or rivers subject to overflows which may close the mouth of the sewer for a protracted period.

Although I have described the sewer system as having a plurality of inlet-conduits 13 and a series of laterals 15, each of the latter having one or more trapped inlet-conduits in communication therewith, it is evident that various modifications may be made in the relation of the inlet-conduits and the laterals with respect to the main sewer 10—such, for example, as the employment of a series of inlet-conduits 23, which communicate with the main sewer at points between the laterals 15. Again, the laterals 15 may be omitted and the individual conduits 13 23 may be employed in large numbers and grouped or arranged in various ways, according to the arrangement of the streets or other places which it is desirable to drain of the surface water. In Fig. 2 of the drawings is illustrated a modification of the sewer system in which the se-

ries of inlet-conduits are disposed in the vertical plane of the main sewer, each inlet-conduit communicating at its lower end with the sewer and having the trapped surface inlet.

5 In Fig. 3 I have shown the inlet-conduit of angular or irregular form, the lower end of said conduit opening into one side of the main sewer, while the upper portion of the conduit is enlarged for the reception of the
10 automatic trap. Again, in Fig. 4 the main sewer is shown as having the diverging lengths or members which meet or intersect each other at the crest of a ridge, each length of the main sewer being in communication
15 with a series of inlet-conduits having the automatic surface traps.

Another important feature of the invention consists in having the main sewer inclined from one end toward the other throughout the length thereof and in connecting a
20 suction appliance to this inclined sewer at or near the point of highest elevation thereof. In the embodiment of the invention as shown by Fig. 1 the main sewer is intended to be
25 inclined from its closed end 12 toward its open mouth 11, and to the main sewer, at or near its closed end, I connect a suction-tube 25, which is in communication with a suitable suction appliance 26, which may be in
30 the form of a rotary fan or blower. In the embodiment of the invention shown by Fig. 4 the suction appliance 25 is connected with the main sewer at the point where the divergent lengths meet at the ridge of a street.
35 The inclination of the sewer-main or either of its lengths provides for the outflow by gravity of the sewage matter toward the open mouth or mouths 11.

The operation of the suction appliance, which is connected to the main sewer at the
40 point of highest elevation thereof, creates a current or draft of air lengthwise of the sewer, said current or draft entering the open mouth 11 of the sewer and flowing toward
45 the suction appliance in a direction opposite to the line of flow of the sewage matter through the main sewer. In the forms of the system shown in Figs. 2, 3, 4, and 6 the circulation of the suction-current in the manner
50 described, as indicated by the arrows, through the main sewer induces the flow of a modicum of air through the air port or ports 21 or through the tube 22, according to whether the plain ports or said tubes are employed,
55 said modicum of air passing into and through the inlet-conduit and the lateral toward the main sewer. The volume of air which is drawn primarily through the main sewer by the suction appliance is augmented by the
60 limited supply of air which circulates through the individual trapped surface inlets, and by this arrangement the noxious gases in the main sewer and all of the laterals and the inlet-conduits entering into the sewer system
65 are thoroughly ventilated by the numerous currents of air which are induced through

the system by the operation of the suction appliance, whereby all the noxious gases and any disease-spreading insects which may accumulate in the system are drawn out and
70 eliminated by the suction mechanism. The foul gases, insects, and other deleterious matters may be subjected to treatment in any suitable way before discharging the same into the air—that is to say, the gases, &c.,
75 may be blown through a crematory-furnace or otherwise disposed of.

The main sewer may be fumigated and disinfected by liberating the disinfectants at the mouth or inside the mouth of said sewer,
80 such disinfectants being drawn by a gentle suction-draft into and through said sewer to the point where the draft appliance is connected therewith. When the air withdrawn from the sewer gives evidence of being heavily
85 charged with the disinfectants, the draft may be stopped in some suitable manner and permit the disinfectants to remain in the sewer until they shall have had ample time to penetrate all the branches and crevices of the
90 sewer system, as well as the house-drains. When the disinfectants shall have had time to do their work effectively, they may be removed from the sewer and its branches by setting the draft appliance in operation.
95

It will be noted that all of the inlet-conduits leading from the streets into the sewer have a considerable rise or inclination from the points of junction with the sewer to the level of the street and that these conduits
100 are channels through which the air in the sewer charged with disinfectants will rise through the channels and traps, thus disinfecting the same. In like manner the air charged with disinfectants will flow from the
105 main sewer into the laterals and up through the inlet-conduits, so that the disinfectants will permeate the traps, thus disinfecting the sewer in all portions thereof. If desired, the laterals may also be disinfected, in conjunction with the main sewer, by liberating the
110 disinfectants at or near the closed or dead ends of the laterals at the same time that the disinfectants are liberated at the open mouth of the sewer. By this means the sewer
115 can be charged as thoroughly with the disinfectants as may be desired, since the fumes or disinfectants, if liberated in considerable volume, must fill the laterals, thus treating each lateral throughout its length, and if the
120 liberation of disinfectants is continued after the suction appliance in the main sewer is stopped the disinfection of the laterals must of necessity be thorough and effective.

In cases where the laterals are too long to
125 be effectively ventilated and disinfected by means of the draft created through the main sewer by the suction appliance each lateral may be provided with a special or individual suction appliance at or near its closed end, in
130 which case each lateral will obtain its strong ventilation and its disinfection through the

mouth of the main sewer, and the rapid air-currents will travel from the junction of the lateral in the main sewer toward the draft appliance connected at or near the closed end of the lateral.

The disinfectant may in some instances be efficiently applied to the main sewer and its laterals at times when the mouth or several mouths of the main sewer is or are closed by flood-tide or high water. At such times the volume of air drawn through the main sewer and its branches may be entirely supplied through the ventilating-passages, which may be in the form of the ports 21 or the pipes 22, 22^a, or 22^b. Hence the velocity of air in the main sewer and its laterals may be quite moderate, and the disinfectants can at such times be introduced into the main sewer through a manhole at the point nearest the mouth of the sewer which is not filled by water. The disinfectants may at the same time be also introduced into the laterals through suitable manholes. From the fact that the short laterals 15 derive the air necessary to create the moderate draft through them from the air-passages 21 or flues 22 such laterals, if in very bad condition, may be disinfected at any time owing to the moderate draft which circulates therethrough even when the draft appliance creates a rapid current through the main sewer.

In the description of the invention reference has been made to the part 18, including the valves 20, as an automatic trap which performs the function of serving in a large measure to check the outflow of noxious gases from the sewer, while at the same time permitting of the inflow of water into the inlet-conduit 13. It will therefore be understood that the term "trap" is intended to mean a manhole or receiving-chamber at the surface end of the inlet-conduit, which manhole or receiving-chamber is provided with an opening covered and uncovered by the valve 20, and which opening consequently constitutes a liquid-inlet for the conduit 13 14, leading to the main sewer. In the principal forms of the invention the normally open fresh-air inlet 21 22 opens through said manhole or receiving-chamber.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from

the spirit or sacrificing any of the advantages of the invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. A sewer-ventilating system comprising a main sewer having a normally open mouth, normally closed liquid-inlets, separate fresh-air inlets for supplying a modicum of air, and means for causing a circulation through the sewer and thereby inducing a circulation through the fresh-air inlets into the sewer while the inlets for liquid remain closed.

2. A sewer-ventilating system comprising a main sewer having a normally open mouth, a series of inlet-conduits in communication with the main sewer and each having a normally closed valved liquid-inlet, and means for causing a ventilation of said inlet-conduits by causing an uninterrupted draft or suction throughout the length of the main sewer while the valves of the liquid-inlets remain closed, substantially as set forth.

3. A sewer-ventilating system comprising a main sewer, a series of inlet-conduits in communication with said main sewer and each having, at the surface end thereof, a receiving-chamber provided with a normally closed valved liquid-inlet for the conduit, a fresh-air inlet through the receiving-chamber of each conduit, and independent of the liquid-inlet thereof, and a suction appliance communicating with the main sewer for inducing an uninterrupted air-current throughout the length thereof and thereby drawing a modicum of air of less energy and volume through the fresh-air inlets and the conduits in communication therewith.

4. A sewer-ventilating system comprising an inclined main sewer, a series of laterals in communication with the main sewer and each having a closed outer end, a plurality of inlet-conduits, each having at the surface end thereof a receiving-chamber provided with a normally closed valved liquid-inlet for the conduit, and a normally open fresh-air inlet in communication with the open portion of the inlet-conduit leading to the sewer, and a suction appliance connected with the main sewer.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE PHILIP HEILMAN.

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